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Thermodynamic Models for Chemical Processes

**Jean-Noël Jaubert
Romain Privat**

Design, Develop, Analyze and Optimize

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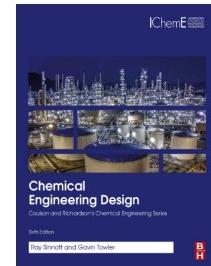


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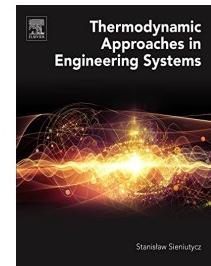
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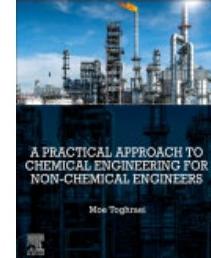
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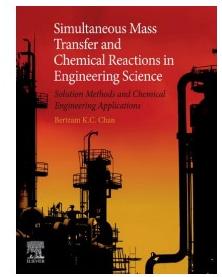
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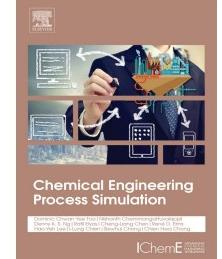
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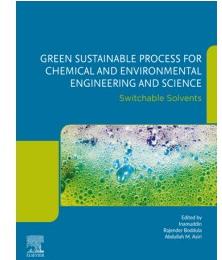
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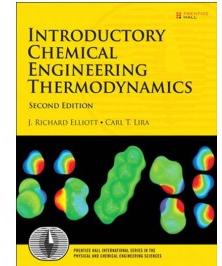
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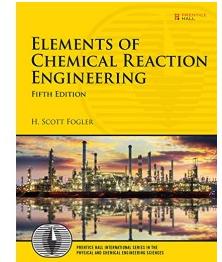
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Preface

This book is not a course book but a vademecum aimed primarily at users of process simulation software. It provides, in a condensed form, the methods governing the choice of a thermodynamic model for a targeted application and reminds the reader of the essential concepts on which these methods are based. At the time of publication (2020), this book was up to date with the main models of practical interest for the engineer and the researcher.

Finally, because we are convinced that, in order to use these models properly, it is important to understand – at the very least – how to carry out the calculations of the properties of interest that result from them, we will also refer to the major points.

Happy reading!

Jean-Noël JAUBERT
Romain PRIVAT
May 2020

Correlations for the Estimation of Thermodynamic Properties of Pure Substances in the Liquid, Perfect Gas or Vapor–Liquid States

1.1. Introduction

A correlation is a mathematical expression, usually simple, of a physico-chemical property y as a function of one or several variables x . In this chapter, dedicated to pure substances, two types of properties are considered:

– **properties depending on the temperature**: for example, the heat capacity at constant pressure of a liquid pure substance (assumed to be incompressible), the saturated vapor pressure of a pure substance, the density of a liquid pure substance (assumed to be incompressible), etc. In these cases, the variable of the correlations is $x = T$;

– **constant properties (which do not depend on the temperature)**: for example, the normal boiling point, the critical pressure, the acentric factor, etc.

We will look at which principal correlations can be used for the pure-substance thermodynamic properties that depend on the temperature T . This chapter will end with a brief presentation of the methods that allow us to *predict* the constant properties and those depending on T using only knowledge of the chemical structure of pure substances. The variables x of correlations then become structural information (as well as T in the case of properties that depend on the temperature).

The T -dependent properties that are taken into consideration in this chapter are:

- the characteristic properties of the **vapor–liquid equilibrium of a pure substance**: saturated vapor pressure $P^{sat}(T)$, molar enthalpies of a boiling liquid $h_L^{sat}(T)$ and of saturated vapor $h_G^{sat}(T)$, molar enthalpy of vaporization $\Delta_{vap}H(T) = h_G^{sat}(T) - h_L^{sat}(T)$, molar heat capacity at constant pressure of the boiling liquid $c_{P,L}^{sat}(T)$, densities of the boiling liquid $\rho_L^{sat}(T)$ or of the saturated gas $\rho_G^{sat}(T)$;
- properties of a **pure perfect gas**: molar enthalpy $h^\bullet(T)$, molar heat capacity at constant pressure $c_P^\bullet(T)$;
- properties of a **subcooled liquid**¹: molar enthalpy $h_L^{pure}(T)$, molar heat capacity at constant pressure $c_{P,L}^{pure}(T)$, volumetric mass $\rho_L^{pure}(T)$. Here, we assume that pure subcooled liquids are incompressible; in other words, their properties are not affected by the pressure.

NOTE.– Properties of a non-perfect gaseous pure substance cannot be described by the correlations presented in this chapter. Suitable methods (mainly based on equations of state) are presented in the following chapters.

1.2. Thermodynamics of the vapor–liquid equilibrium of a pure substance: what should be remembered

1.2.1. Phase-intensive variables and global-intensive variables

The intensive state of a two-phase system can be described by two sets of variables:

- **phase**-intensive variables, which are the intensive variables specific to one of the two phases of the system, for example, the temperature of the liquid phase, the pressure of the gas phase, the density of the liquid, the molar heat capacity of the gas phase at constant pressure, etc.;

1 The term “subcooled” refers to a liquid that has been brought to a temperature below its boiling point. Consequently, the pure substance is not boiling (is not at vapor–liquid equilibrium).

— **global**-intensive variables that are not specific to a given phase but which instead characterize the two-phase system as a whole (i.e. the whole system). As an example, we cite the *molar proportion of the gas phase* (defined as the quantity of matter present in the gas phase divided by the global quantity of matter in the system, i.e. the sum of the quantities of matter in the liquid and gas phases), the global density (defined as the global mass of the system, i.e. $m_{\text{liquid}} + m_{\text{gas}}$, divided by the global volume, i.e. $V_{\text{liquid}} + V_{\text{gas}}$), etc.

NOTE.— As explained in the following, at the vapor–liquid equilibrium, the two phases have the same temperature ($T_L = T_G$), the same pressure ($P_L = P_G$) and each component has the same chemical potential in each phase ($\mu_{i,L} = \mu_{i,G}$). Thus, the temperature, pressure and chemical potential of a component i are both phase-intensive and global-intensive variables.

Since the extensive properties are additive, the global extensive properties of a two-phase system are obtained by adding the extensive properties of the two phases:

$$\underbrace{Q_{\text{two-phase system}}}_{\text{Global extensive property}} = \underbrace{Q_{\text{liquid phase}}}_{\substack{\text{Extensive property} \\ \text{of the liquid phase}}} + \underbrace{Q_{\text{gas phase}}}_{\substack{\text{Extensive property} \\ \text{of the gas phase}}}$$

[1.1]

with : $Q = \begin{cases} n \text{ (quantity of matter in mol)} \\ V \text{ (volume in m}^3\text{)} \\ H \text{ (enthalpy in J)} \\ C_p \text{ (heat capacity in J}\cdot\text{K}^{-1}\text{)} \\ \dots \end{cases}$

Consequently, the relationship between the molar properties of the phases that derive from extensive properties ($q_{\text{liquid phase}} = \frac{Q_{\text{liquid phase}}}{n_{\text{liquid phase}}}$, $q_{\text{gas phase}} = \frac{Q_{\text{gas phase}}}{n_{\text{gas phase}}}$) and global molar properties ($q_{\text{two-phase system}} = \frac{Q_{\text{two-phase system}}}{n_{\text{two-phase system}}}$) is:

$$\frac{Q_{\text{gas phase}}}{n_{\text{gas phase}}} \text{ and } q_{\text{two-phase system}} = \frac{Q_{\text{two-phase system}}}{n_{\text{two-phase system}}}$$

$$q_{\text{two-phase system}} = \frac{n_{\text{liquid phase}}}{n_{\text{two-phase system}}} q_{\text{liquid phase}} + \frac{n_{\text{gas phase}}}{n_{\text{two-phase system}}} q_{\text{gas phase}} \quad [1.2]$$

with $q = \{v, h, c_p, \dots\}$. Equation [1.2] introduces the molar proportions of the phases:

$$\left\{ \begin{array}{l} \text{Molar proportion of gas: } \tau = n_{\text{gas phase}} / n_{\text{two-phase system}} \\ \text{Molar proportion of liquid: } 1 - \tau = n_{\text{liquid phase}} / n_{\text{two-phase system}} \end{array} \right. \quad [1.3]$$

Figure 1.1 represents a two-phase system that illustrates, on the one hand, the notion of extensive (also known as *total*) and intensive properties that are specific to one of the phases, and, on the other hand, the notion of properties that are characteristic of the two-phase system (known as *global*).

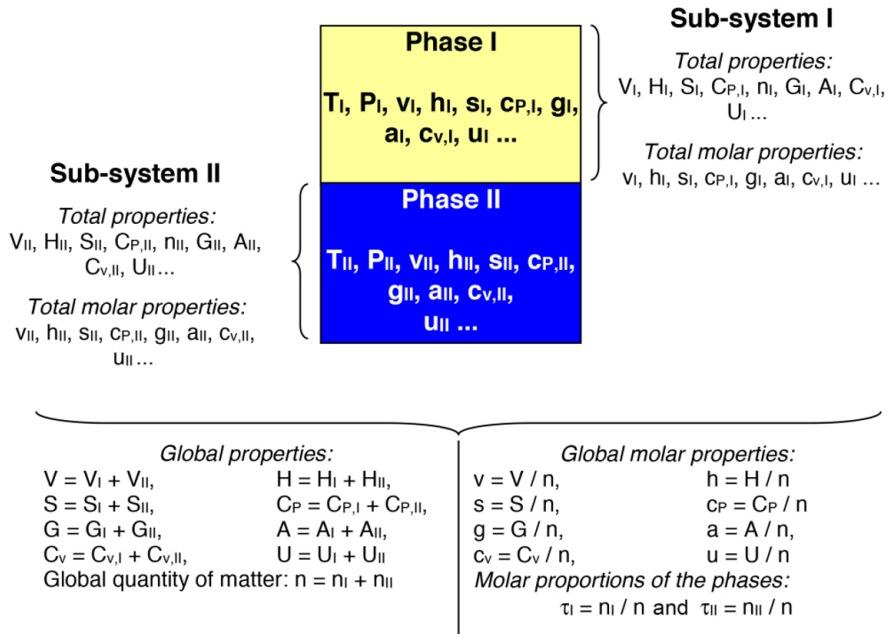


Figure 1.1. Definition of total, total molar, global and global molar properties

1.2.2. Conditions of two-phase equilibrium of a pure substance

For **two-phase equilibrium** to be observed, three conditions must be met:

– **thermal equilibrium condition:** there is no heat transfer between the phases in equilibrium, and consequently, these necessarily have the same temperature:

$$T_I = T_{II} \quad [1.4]$$

– **mechanical condition of equilibrium:** there is no work transfer of the pressure forces between the phases in equilibrium, and consequently, these are necessarily at the same pressure:

$$P_I = P_{II} \quad [1.5]$$

– **diffusive equilibrium condition:** there is no transfer of matter between the phases in equilibrium, and consequently, the chemical potential of the pure substance g (molar Gibbs energy) is the same in both phases:

$$g_I = g_{II} \quad [1.6]$$

1.2.3. Why should the intensive properties of the liquid and vapor phases of a pure substance in vapor–liquid equilibrium be seen as temperature functions?

The answer to this question is provided by the Gibbs phase rule described below. This theorem concerns the variance of a thermodynamic system, the definition of which is also provided.

According to the previous paragraph, the intensive variables of a phase α are the temperature T_α , the pressure P_α and the total molar properties y_α ($y \in \{v, h, g, s \dots\}$).

DEFINITION.– The *variance* is defined as the number of independent **INTENSIVE** variables of **PHASES** that need to be set (specified) in order to characterize the **INTENSIVE** variables of **ALL PHASES**.

The **Gibbs phase rule** is a theorem asserting that the variance of a thermodynamic system that contains one or several phases in equilibrium, with no other characteristics, is given by the expression:

$$v = c + 2 - \varphi \quad \text{with:} \begin{cases} v = \text{variance of the system} \\ c = \text{number of components} \\ \varphi = \text{number of phases in equilibrium} \end{cases} \quad [1.7]$$

Consequently, the variance of a two-phase system ($\varphi=2$) that contains a pure substance ($c=1$) is $v=1$. This means that by specifying a single intensive variable of one out of the two phases, and the value of all the others is then set.

For example, let us suppose that the pressure P_G of the gas phase of a pure substance in vapor–liquid equilibrium is specified. Because of the Gibbs phase rule, this then necessarily sets the pressure of the other phase in equilibrium (this is obvious as the condition of equilibrium between phases imposes $P_L = P_G$), the temperature common to the two phases $T_L = T_G$ (common according to the phase-equilibrium condition), the molar volumes v_L^{sat} and v_G^{sat} of the phases, the molar enthalpies h_L^{sat} and h_G^{sat} of the phases, etc.

A **two-phase equilibrium is therefore monovariant**. This feature induces an immediate graphical consequence: **in the plane projections of phase diagrams for pure substances** with two intensive phase variables as X and Y coordinates (e.g. pressure–molar volume, pressure–temperature, molar enthalpy–molar entropy planes), two-phase equilibria are represented by curves (the curves are the graphical representations of single-variable functions).

Similarly, the Gibbs phase rule, which predicts that the variance of a pure single-phase substance ($\varphi=1$) is equal to 2 and that the variance for a pure three-phase substance is zero, the associated graphical representations in the plane projections of the phase diagrams will be surface regions and single points respectively. These remarks are summarized in Figure 1.2 (the definition of the critical point, which is represented in this figure, will be provided at a later stage).

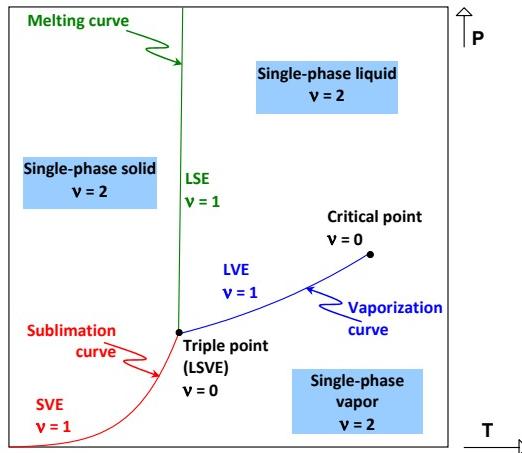


Figure 1.2. Projection of the phase diagram for a pure substance in the pressure–temperature plane. Illustration of the relationship between the variance of a system and the nature of its representation on the plane. VLE = vapor–liquid equilibrium, LSE = liquid–solid equilibrium, SVE = solid–vapor equilibrium, LSVE = liquid–solid–vapor equilibrium

Let us now return to the example of a vapor–liquid pure substance for which we specified the pressure of the gas phase. We will illustrate on a graph the monovariant nature of this two-phase equilibrium. Figure 1.3 is a representation in the (P, v) and (P, T) plane projections of the phase diagram of a given pure substance. The specification of the pressure P_G of the gas phase in vapor–liquid equilibrium is shown by a horizontal dot-dash straight line.

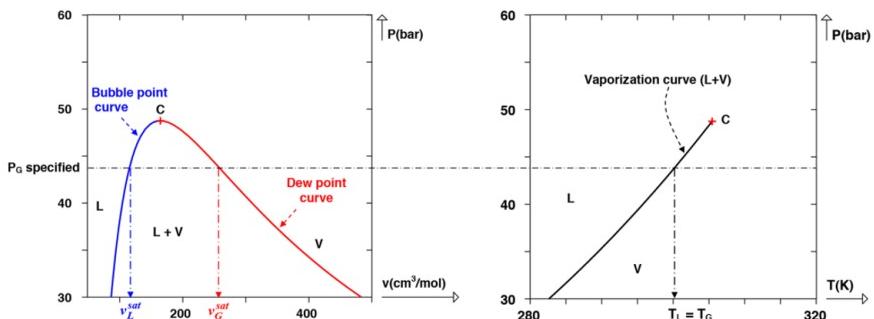


Figure 1.3. Illustration of the Gibbs phase rule in the case of a pure substance in vapor–liquid equilibrium for which the pressure of the gas phase is specified. Left: phase diagram of a pure substance in the plane (P, v) . Right: phase diagram in the plane (P, T) . “L”: single-phase liquid domain, “V”: single-phase vapor domain, “L+V”: two-phase vapor–liquid domain; “C”: critical point

The (P, v) plane shows that by specifying P_G , the following properties are then defined: (i) a unique molar volume for the liquid phase (v_L^{sat}) defined by the intersection point of the bubble point curve (representing the vapor–liquid equilibrium pressure versus v_L^{sat}) and the horizontal straight line $P = P_G$, (ii) a unique molar volume for the gas phase (v_G) found at the intersection of the dew point curve (representing the vapor–liquid equilibrium pressure versus v_G^{sat}) and the horizontal straight line $P = P_G$. The (P, T) plane, on the other hand, shows that this specification induces also a unique vapor–liquid equilibrium temperature $T_L = T_G$ (at the intersection of $P = P_G$ and the vaporization curve).

NOTE.— The temperature of a pure substance in vapor–liquid equilibrium is known as the **boiling point temperature**. When the pressure is specified, it is noted $T_{bp}(P)$. The **normal boiling point temperature**, denoted as T_{bp}° , is the boiling point temperature under normal pressure $P^\circ = 1 \text{ atm}$, in other words 101,325 Pa.

Choice of the variable for correlations of phase-intensive properties for pure substances in vapor–liquid equilibrium: the previous paragraph insists on the need to set an intensive variable of a phase in order to characterize a vapor–liquid pure substance. In practice, often the temperature is chosen as the correlation variable. In doing so, the intensive properties of the phases are written: $P_L(T) = P_G(T)$ [pressures], $h_G^{sat}(T)$, $h_L^{sat}(T)$ [molar enthalpies], $v_L^{sat}(T)$, $v_G^{sat}(T)$ [molar volumes], $g_L^{sat}(T) = g_G^{sat}(T)$ [molar Gibbs energies], etc.

NOTE.— The pressure of a pure substance in vapor–liquid equilibrium is known as the **saturated vapor pressure**. When the temperature is specified, it is written $P^{sat}(T)$. The molar volumes of the liquid and gas phases in vapor–liquid equilibrium are known as **molar volumes of the saturated liquid** and **saturated gas phases**, denoted respectively as $v_L^{sat}(T)$ and $v_G^{sat}(T)$.

The definitions of the boiling point temperature (at a specified pressure) and of the saturated vapor pressure (at a specified pressure) are summarized in Figure 1.4.

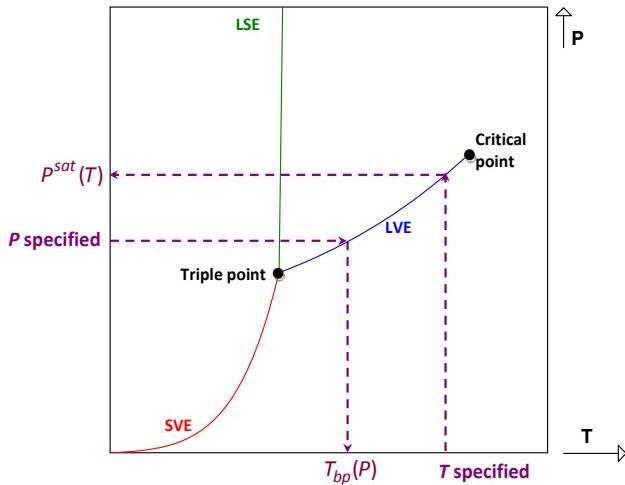


Figure 1.4. Illustration of the definitions of the saturated vapor pressure and of the boiling point temperature in the pressure–temperature plane of a pure substance. VLE = vapor–liquid equilibrium, LSE = liquid–solid equilibrium, SVE = solid–vapor equilibrium

1.2.4. Critical point of a pure substance

The critical point of a pure substance can be defined in three ways:

- in the (P, T) plane, it is the end point of the vaporization curve of a pure substance (see Figure 1.2);
- in the (P, v) plane, this is the common maximum for the bubble point curves and dew point curves (see Figure 1.3);
- on the critical isotherm in the (P, v) plane, it is a point of inflection with a horizontal tangent. This definition of the critical point is illustrated in the following section.

1.2.5. Isotherms of a pure species in the fluid region

In the (P, v) plane, an isotherm for a pure substance is a curve made up of all the (molar volume, pressure) couples associated with the same temperature.

Subcritical isotherms (subcritical means that the temperature is below the critical point temperature) are made up of three sections:

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GLUCK.

From a pencil drawing of bust by the sculptor Houdon; probably a study for the statue in the Paris Opera House. See page [237](#).

With the appearance of this second declaration of war the attacks of criticism against Gluck became more numerous and violent, and it must have been the master's earnest wish to find a place for his activity which should be less under the musical influence of Italy than was Germany. Such a place was Paris, whose artistic conditions were the more favorable for Gluck's plans of reform in that the representatives in philosophy and *belles-lettres* set the standard in musical matters also, and with cultured people their opinion went much farther than that of the exceedingly conservative professional musicians. What attractive conditions for a composer who, at war with tradition, assigned to poetry the first place in the opera, while music should be but its servant!

Gluck did not hesitate to seize the opportunity, in 1772, of becoming more intimate with the Bailli *du Rollet*, a man fond of literature, highly cultivated, and enthusiastic over his music. Gluck had known him in Rome and now met him again as Attaché of the French Embassy in Vienna. A closer acquaintance with *du Rollet* gave the composer the means of carrying into effect his plan of going to Paris. Without regard to his former co-worker, Calzabigi—Gluck's relations with the latter may well have been changed since the failure of "Paris and Helen"—the master bound himself to *du Rollet*, who agreed to prepare, with his help, Racine's "Iphigénie in Aulis," and to bring about the performance of the work in the great Parisian Opera. The difficulties which arose from the business transactions with the directors of the Grand Opera were entirely overcome by an emphatic word from one of Gluck's former pupils, Marie Antoinette, who had been placed, in the meantime, upon the French throne, and in the autumn of 1773 Gluck was able to leave Vienna for Paris.

In Paris the German master was received with open arms by the court as well as by leaders in the literary circles. The protection of the former was of special consequence to Gluck, as he was to have infinitely greater trouble with the singers and musicians than he had experienced in Vienna. Even at the first rehearsals of his opera he was convinced that the principal actors of the "Académie royale de musique" (Royal Academy of Music), which was the official name of the Grand Opera, left much to be desired in singing, pronunciation, acting and all else. The dancers, who, until within a few years, had always entered with masks, entirely lacked the ability to assist the action by their pantomime as Gluck desired. The chorus was accustomed to march up and down in rank and file, the men on one side and the women on the other, and then to stand immovable. The orchestra finally reached the extreme height of laziness and lawlessness; in cold weather the entire company played in gloves, and the only way the leader could achieve any kind of *ensemble* was to beat the time loudly on his desk. And now Gluck made short work of the belligerents. To the singer who assumed the rôle of Iphigenia and in a rehearsal refused to follow instructions he said: "Voyez-

vous, Mademoiselle, je suis ici pour faire exécuter Iphigénie; si vous voulez chanter, rien de mieux; si vous ne le voulez pas, à votre aise. J'irai voir la reine et je lui dirai, il m'est impossible de faire jouer mon opéra. Puis je monterai dans ma voiture et je reprendrai la route de Vienne." ("Mademoiselle, I am here to bring out Iphigenia: if you will sing, nothing can be better; if not, very well, I will go to the Queen and will say: It is impossible to have my opera performed; then I will take my seat in my carriage and return to Vienna.") Certainly the majority of the coöoperators would have been glad to get rid of the master in this way, but knowing the court to be on his side, there was nothing to do but submit.

The day of the representation of "Iphigénie" (19 April, 1774) was anticipated with excitement by all Paris. In literary circles—the so-called bureaux d'esprit (offices of wit)—there were arguments for and against Gluck. In the first place here was a composer who had spoken the apparently paradoxical words which were nevertheless true: "When I compose operas I try, first of all, to forget that I am a musician," and in these circles there was violent opposition to the extremely self-confident reformer. Baron Grimm, a subtle critic and known as the patron of young Mozart during his second sojourn in Paris, thus describes, in a most graphic way, the ruling sentiments: "For two weeks Paris has been thinking and dreaming nothing but music. Music is the subject of all our debates, of all conversation; it is the life of all our suppers, and it would be simply ridiculous to show interest in anything else. To a political question the reply is a melody, to a moral reflection, the ritornelle of an aria; if one tries to excite interest in Racine or Voltaire he is reminded of the effect produced by the orchestra in the recitative of Agamemnon. Need I say that it is Gluck's 'Iphigénie' which has excited such a furore? A furore all the more tremendous because of the difference of opinion and the fanaticism of parties. One party swears that no other gods than Lully and Rameau shall be recognized; another believes only in the melodious revelations of Jomelli, Piccini and Sacchini; a third will hear of no other composer than Gluck, who has found the only true dramatic music drawn from the eternal fount of harmony, from the

most intimate union of mind and soul; a music that belongs to no land, but which he has genially appropriated to our language."

It goes without saying that opinions differed even upon the evening of the first representation, but upon the second, applause was unanimous, or, as Grimm expresses it, "*Iphigénie*" was applauded "aux nues" (to the clouds). The series of successful representations was interrupted by the death of Louis XV., in consequence of which the theatre was closed for thirty-four days. This interruption was, however, employed in studying the "*Orpheus*," which meanwhile had been translated into French by Moline. Gluck had to make several important changes in the music, for the Academy of Music had no eunuchs among its members (the French public never having found pleasure in such singers), and the master was obliged to transpose for the tenor the title-rôle written for alto. Although by the substitution of the brilliant tenor for the melancholy alto the part of "*Orpheus*" lost something of its charm, "*Orphée et Euridice*" still had a success which far exceeded that of "*Iphigénie*." It was a special joy to Gluck that J. J. Rousseau, who had been one of his partisans, soon after the appearance of "*Iphigénie*" became one of his enthusiastic admirers. The philosopher of Geneva affirmed that the music of "*Orpheus*" had reconciled him to existence, and the reproach cast upon Gluck's music, that it was lacking in melody—a reproach, by the way, which no musical innovator, up to the present day, has been spared—he met with the words: "I believe that melody proceeds from every pore." Besides this, after Gluck had taught him better, Rousseau did not hesitate—and this does him honor—to publicly acknowledge that he had made a serious mistake in stating that the French language was unsuitable to set to music.



NICOLA PICCINI.

Gluck's rival in Paris from 1776 to 1779.

Of the 150 Italian Operas written by this composer not one has survived.

It would lead us too far to enter into the reasons given by Rousseau in his "Lettre sur la musique française" (Essay upon French music) in support of his former opinion. In the main he accused the French language—and justly—of being devoid of all accent (*destituée de tout accent*) and concluded that Gluck's efforts to bring about a reform in French opera had no chance of success. But he did not know or did not consider that language without accent to a German is quite incomprehensible, that a German composer cannot do otherwise than satisfy his inborn love of accent in the use of a language that is foreign to him. While Gluck thus breathed a vital element into French song, a need felt by the French themselves, but which they did not know how to meet, he won the warmest

recognition of all truly musically-gifted Frenchmen and that of the French-Swiss Rousseau among them.

Results of such importance could not be affected by the fact that two of Gluck's earlier works, the operetta "L'arbre enchanté" (The Enchanted Tree) and the opera ballet "La Cythère assiégee" (Cythera Besieged), when performed in Paris the following year (1775), found but a lukewarm welcome. The master had left Paris before the representation of the latter work, not to rest on his laurels, but to begin at once the composition of two new operas, "Roland" and "Armide," both by Quinault, which, with the French adaptation of "Alceste," were intended for representation in Paris the following year. In the midst of his work, however, he was surprised by the news that, at the instigation of his opponents, the directors of the Grand Opera had called to Paris the famous opera-composer Nicola Piccini, and had likewise confided to him the composition of "Roland." In a violent rage Gluck destroyed what music of "Roland" was already completed and wrote an angry letter to his co-laborer du Rollet, who was then tarrying in Paris, in which, without denying his respect for the talent of his rival, he accused his opponents of treachery and overwhelmed their spokesman, the author Marmontel, with bitter ridicule. This letter, which du Rollet had printed in the periodical "L'année littéraire," gave the signal for a literary war, which in matters of art has never been surpassed in bitterness except, perhaps, at the appearance of Richard Wagner. A vivid picture of this is given in the collection of newspaper reports, brochures, eulogies and satires (which appeared in Naples in 1781 and in German translation in 1823) called forth by Gluck's opera-reforms, and entitled "Mémoires pour servir à l'histoire de la révolution opérée dans la musique par M. le Chevalier Gluck." (Memoirs: a Contribution to the History of the Revolution brought about in Music by M. le Chevalier Gluck.)

When, at the beginning of the year 1776, Gluck returned in order to rehearse "Alceste," he found the cultured people divided into two parties under the names "Gluckists" and "Piccinists," drawn up in line of battle. Again, as in 1752, at the appearance of the Italian bouffe-

singers there were formed in the theatre the King's party and the Queen's party; for the king, though not in the least musical, thought it his duty to defend the older opera, while the queen with unwavering fidelity remained true to her countryman and former instructor. At the head of the Gluckists stood the *Abbé Arnaud* and *Suard*, the proprietor of the "Journal de Paris," while for Piccini, who had arrived in Paris before Gluck, stood *Marmontel* and the editor of the noted paper "Mercure de France," *Laharpe*. At the first representation of "Alceste" victory for the Piccinists seemed assured, so utterly did the opera fail, the last act being actually hissed. But, as frequently upon former occasions, the public altered its opinion with each successive performance and bestowed ever richer applause upon the "Alceste" in the thirty-eight consecutive representations. Gluck's fame rose still higher, however, with the presentation of "Armide" (Sept. 23, 1777), in consequence of which his bust was placed near those of Lully, Rameau and Quinault in the foyer of the Grand Opera.

And what were the personal relations of the two masters whose adherents fought so bitterly? Fairly friendly, as among fellow-artists, after they had become acquainted at a banquet which *Berton*, one of the directors of the Grand Opera, had happily given in their honor. Later, they had occasion to put this friendly feeling into action; when Piccini's "Roland" was being studied and at a rehearsal the composer was thrown into the utmost confusion, being unused to conducting and unfamiliar with the French language, Gluck, who happened to be present, rushed impulsively into the orchestra, threw aside wig and coat and led with such tremendous energy that everything ran smoothly; he also joined most cordially in the applause given his rival upon the appearance of "Roland" in January, 1778. Piccini, on the other hand, when he heard of Gluck's death, expressed his regard for the departed by starting a subscription for the establishment of a yearly concert to be given upon the anniversary of Gluck's death at which nothing but his compositions should be given. The friendly relations of the rivals had another severe test. After Gluck had found a new co-laborer in the poet *Guillard*, and had

gone to Vienna with the text of "Iphigénie in Tauris" to set it to music, the directors of the Grand Opera, as in the case of "Roland," were again speculating on the Parisians' love of sensation and induced Piccini also to compose an "Iphigénie in Tauris," which should appear before that of Gluck. This time, however, our master did not propose to relinquish his rights; toward the end of the year 1778 he returned to Paris, and with the aid of the queen so carried his point that the supposed warfare "man to man" ceased and his work gained the precedence. His "Kampf ums Recht" (Fight for the Right) was crowned with brilliant success; not only did those who were co-operating in the production of "Iphigénie" show themselves well-disposed and even enthusiastic in their task, but at the first performance of this work (May 18, 1779) the effect upon its hearers was magical. The ideal of all earnest friends of the opera seemed attained in the "Iphigénie in Tauris," and even the cautious Grimm, overcome by the impressions of this representation, wrote: "I know not if what we have heard be a melody. Perhaps it is something much better; I forget the opera and find myself in a Greek tragedy."

After this memorable evening it could no longer be doubted that the war between the Gluckists and Piccinists was over; that the German master had been victorious. True, the "Iphigénie in Tauris" of Piccini, given about a year later (January, 1781), was also extremely successful, but when the experiment was made, soon after, of producing alternately the operas of the two masters, after slight hesitation, the public decided by a large majority—as is shown by the receipts—in Gluck's favor.^[5]

Unfortunately Gluck's Parisian activity closed with a failure. The last opera which he produced there, Baron von Tschudi's "Echo and Narcissus" (autumn of 1779) was coldly received, and after a few representations disappeared from the repertoire. From the fact that in this the master lavished his skill on a dull, dramatically ineffective text, we may conclude that he owed more to chance than to his literary ability in finding such an excellent text for "Iphigénie in Tauris." Even his follower, C. M. von Weber, was quite doubtful in

regard to the dramatic effect of a text, as is proved in his choice of "Euryanthe." In this same year Gluck left Paris and never returned. In possession of a considerable fortune and loaded with honors he passed the last years of his life in Vienna in comfort and ease. Owing to an iron constitution he recovered from a severe illness the following year and his adherents in Paris did not relinquish the hope of seeing the master again in their midst, but this they were forced to do when, in 1784, Gluck had a stroke of paralysis. It is true he recovered from this, but a second stroke, three years later, put an end to his life. In his death the whole artistic world shared the heavy loss sustained by art. Vienna in particular honored the memory of her celebrated citizen with grand funeral services, when his "De profundis" came to light, as well as other treasures of his mind to which he had devoted his constant and most loving care.



GLUCK'S GRAVE IN VIENNA.
From a photograph.

After what has been said concerning the progress of Gluck's development, stress need hardly be laid upon the fact that, in reviewing his work, poetry no less than music must be considered. In the first place we cannot refuse the poet of "Orpheus," Raniero Calzabigi, the honor of having had a considerable share in the reform effected by our master. In view of the then prevailing indifference of the opera-lovers to the text, we cannot be surprised that the credit of the opera-reform was attributed to Gluck, whose name entirely eclipsed that of his co-laborer. That Gluck himself, however, is not accountable for this mistake, is proved by his letter sent to the "Mercure de France" in Feb., 1773, in which he says: "I should bitterly reproach myself were I to consent to having attributed to me this new kind of Italian opera, the success of which has justified the experiment. To Calzabigi, rather, belongs the special credit, and if my music proves effectual I must thank him who has put me in a position to draw freely from the well-springs of my art." Due allowance should be made for Calzabigi's own statement, as this was published after Gluck had parted from his first co-worker in the inconsiderate way already mentioned, and the latter had every reason to be incensed with him. In a letter addressed to the "Mercure" (June 25, 1784), he says, among other things, that he had convinced Gluck that musical expression should be based upon an expressive rendering of the libretto, that he had begged him to banish from his music all ornate passages, cadenzas and ritornelles, and Gluck had yielded. We may confidently assent to his closing words: "I hope you will concede from this *exposé* that if Gluck is the author of dramatic music he has by no means created it out of nothing. It was I who gave him the material, or, if you will, the chaos; the honor of this creation should, therefore, be shared equally between us." Finally, the following words from Gluck's preface to "Alceste" are sufficient proof that Calzabigi's claims were just. "By a lucky chance I happened upon the very *libretto* in which the celebrated author had developed a *new plan* for the musical

drama," a statement which only through an inconceivable blunder could have been given the interpretation "the celebrated author of '*Alceste*,' Herr von Calzabigi, *carried out my plan for a lyric drama*" attributed to Gluck by Anton Schmid and his numerous followers.

Let us now consider Gluck's works, beginning with "*Orpheus*." Even in this first opera we find the libretto as well as music at the extreme limit of his departure from the old forms. The break with the old opera is a complete one; it seems to be the opinion of successive generations by whom the "*Orpheus*" has been considered Gluck's most sympathetic work, that it would have been impossible to reach a greater climax. The action is of the most extreme simplicity; to the myths transmitted from Virgil and Ovid the operatic poet makes no material addition. In the first act we hear the lamentations of Orpheus and his companions at the loss of the beloved; whereupon Amor (Cupid) appears, to bring the singer the consoling word that Euridice can be restored to him provided he possesses not only courage to descend to Hades, but the moral strength to refrain from looking at his love until they shall have again reached the upper world. The second act is laid in Hades and begins with the dances and songs of the furies. To the entreaty of Orpheus to abate their wrath, they answer with a horribly inexorable "No!" At length, however, they are unable to resist his supplication and open to him the door of Hades. The scene now changes to a charming region of the Elysian Fields, enlivened by the song of the departed spirits and later of Euridice herself. The prayer of Orpheus to the shades that his wife may be restored to him is not unheeded; she is brought to him, he seizes her hand and without looking at her, leads her away. The beginning of the third act represents the tragic conflict of the lovers. Euridice, who knows nothing of Cupid's injunction, is in despair that Orpheus stubbornly refuses to regard her or to make reply to her words of soft entreaty; but finally his power of resistance fails, he turns toward his wife to embrace her, whereupon she sinks back lifeless, now apparently irrevocably lost. Once again, however, the gods have compassion, and at the moment in which Orpheus, in desperation, is about to end his life, Cupid again

appears, and satisfied with the fidelity of Orpheus pardons the false step and leads the lovers to the upper world to unite them there forever.



Ihr König Wiederfahrt Ihr Gott Ihr
Ihr feindig Von dem Zeitung und Caloudous vol
fur portion Ich fendi ißwachz und die Rostow
Zu Eschweitz, was ich wahrn Cothen Von der Völker unter
erichtigen, wahr nicht frumaylisch sag ich zuerichz
Jedoch gabt Ihr mich für euren Leib, die Paganini
Vogelklinge bin ich zu Euch, Mein Vater und Tochter
mich ist Ihr Compliment und Ihr ich Ihr von
So flieht zu Euch, und ich hablir Ihr

*Eins fürgottwur
Gluck*

Fac-simile autograph letter and musical manuscript by Gluck.

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Judging from his own words, the simplicity of the action did not deter the composer from employing extensively all aids to his art. In order to do full justice to his music we must remember his great successor who, much more richly endowed and filled with a spirit of

a new time, far surpassed him as a musician—Mozart, who in this case could confirm the old saying: "Let well enough alone." Still more, if we look backward and contrast the greatest representative of the older Italian opera, Handel, with Gluck, we are astonished at the progress made by opera-music through the former. The old-fashioned ornate music of Handel has disappeared; true expression has gained the supremacy, although it never reigns at the expense of the melody which is almost inexhaustible and in its grace betrays in every measure the country whence it came. The celebrated aria "Che farò senza Euridice" is an example of Gluck's power to harmonize the greatest nobility of sentiment with the insinuating charm of melody. A sharp characterization corresponding to modern emotion is of course excluded here, and one of Gluck's French critics is not incorrect in his assertion that one can sing to the aforesaid air "J'ai trouvé mon Euridice" as well as "J'ai perdu mon Euridice." (I have *found* my Euridice as well as I have *lost* my Euridice.)

In the part of Euridice and in the duet of husband and wife, Gluck's power of musical delineation is even greater, but most impressive are the choruses in which the influence of the Handel oratorios is unmistakable. The chorus of the furies forbidding Orpheus the entrance to Hades is one of the most affecting, most impressive in the entire province of dramatic music, and serves to heighten the restful effect of the graceful ballet of a chorus of blessed spirits led by a flute solo, which immediately follows. Here the effect produced by the orchestra must not be overlooked, neither the modest means of this orchestra, which in the "Dance of the Furies" consists merely of a string quartette, two horns, oboe and flageolet.

As regards the music, the "Alceste" is more admirable than the "Orpheus," in that the uniformity of the libretto has put the skill of the composer to the more severe test. Even J. J. Rousseau averred that he knew of no opera in which the expression of the passions was more uniform than in "Alceste"; that all revolved about the two conditions of the soul, love and fear, and to describe these two sensations over and over again without monotony, required the composer's utmost skill. Rousseau makes also the just criticism that

in the last act, where a climax is most needed to hold the listeners to the end, the interest flags. In point of fact the action of the "Alceste" is more feeble than that of "Orpheus." In agreement with Gluck, Calzabigi has preserved in his poetry the entire strength and simplicity of his prototype, the "Alceste" of Euripides; even the element of the unexpected which appears in "Orpheus" is not here employed. Admetus, King of Thessaly, is dangerously ill; his death is hourly expected. Apollo, who once, when driven from Olympus, found favor with the King, wishes to express his gratitude and causes his oracle to proclaim that if another person will voluntarily die for him, Admetus shall live. While the people, horrified, take flight, Alceste declares herself ready to sacrifice her life for her beloved husband. She dies, but Apollo (not Hercules, as in Euripides) appears at the same instant, rescues her from death and restores her to her family and people.

In his "Alceste" Gluck has exercised all his talent as composer in order to give the most intense musical expression to the evangel of devoted, self-sacrificing love. Naturally, it is to the noble, touching figure of the queen, wife and mother that he devotes the greatest love and care. Courageously she faces death with the words of the famous aria, "Ombre, larve, compagne di morte"; and the tenderest mother speaks in her when in parting from her children she makes her last petition: "Venite sovete alia mia tomba ornatela di fiori."

Further, the choruses in "Alceste" are overpowering in effect, which fact indicates a step in advance of "Orpheus" in so far that here the orchestra conduces infinitely more to the portrayal of the situation. Even in the first mentioned arias of "Alceste" the instruments, especially the trumpets, are employed in the most telling manner. Still more stirring is the orchestral action following the decree of the oracle, in the chorus "Fuggiamo!" Scarcely have the words of the gods died away when the basses are heard, in dull, sustained tones, descriptive of the murmur of the multitude. The murmuring grows louder and individual cries are heard until finally the entire mass of orchestra and chorus unites in the cry: "Let us away!" The full power of the Gluck orchestra, however, is revealed in the chorus of the

gods of death which is sung upon one key by the basses, while the melody is sustained by the instruments. As an orchestral piece of the highest, most imperishable worth the sacrificial march in the first act deserves special mention. In this the melody, sustained simply by stringed instruments and low flutes, is quite different in character from ordinary marches and cannot fail to produce upon the mind of the hearers the mood corresponding to the high religious action.

Of "Paris and Helen" the reader knows already that, in spite of the sanguine hopes of the composer, the work was decidedly rejected by the public. He will remember also that Gluck, in this case, was not disposed to recognize the "vox populi" as the "vox dei," as he gave vent to indignation at his failure in the dedication of the work to the Duke of Braganza. Later, however, he must have acknowledged the justice of the judgment pronounced by the Viennese public, proved, if in no other way, by the fact that he did not consider "Paris" suitable to appear at the Paris Opera with "Orpheus" and "Alceste." Still, this almost unknown opera has its significance in the resumé of the master's development. In his endeavor to draw a sharp contrast between the principal figures—the effeminate Phrygian and the pure, true Spartan maid—Gluck has gained perceptibly in this direction of his art, and in the vocal as well as in the orchestral parts the peculiarity of each distinct nation is expressed. This is apparent even in the overture, which is more nearly related to the drama than in the case of Gluck's former operas, in that certain of its motives are repeated in the course of the action.

The overture to "Paris and Helen" may serve as a bridge from those works to which Gluck had given his whole creative strength and in which he had, so to speak, surpassed himself, to the works of the Parisian period, which is commonly regarded as the master's third period, though incorrectly, for in point of fact, Gluck's activity is divided into but two sections: the time before and the time after his acquaintance with Calzabigi. This is not saying that Gluck, in the presence of a drama as important as "Iphigénie in Aulis," the first real drama which he undertook to set to music, took, as it were, new impetus in order to outdo himself if possible for the sake of the Paris

public whose judgment he so thoroughly respected. This is demonstrated in the overture to the aforesaid opera which, corresponding to this sort of ideal prologue, transports us to a higher sphere, in which we are prepared for the drama. "Here, as in the overture to 'Don Juan,'" says Richard Wagner, "it is the struggle or at least the juxtaposition of two adverse elements which determines the movement of the piece. Even in the action of 'Iphigénie' these two elements appear. The army of Greek heroes is assembled for the purpose of a great mutual undertaking; inspired by the thought of this alone, all other human interest disappears before that of the masses. Opposed to this is the interest attaching to the preservation of a human life, the rescue of a tender maiden. With what characteristic perspicuity and truth has Gluck almost personified these contrasts! In what lofty proportion has he measured them and made such contrast that by this juxtaposition alone is the opposition, and in consequence the movement given! By the ponderousness of the principal motive advancing solemnly, the mass of the people united in one interest is recognized, while immediately in the succeeding theme the interest in the suffering, frail creature fills us with compassion. The repetition of this single contrast throughout the composition gives us the great idea of the Greek tragedy, filling us alternately with fear and pity. Thus we attain to the lofty, excited state which prepares us for a drama the highest meaning of which it reveals to us at the outset and so leads us to understand, according to this meaning, the action which immediately follows."

In his treatment of the subject-matter of "Iphigénie in Aulis," Gluck's co-worker, du Rollet, has closely followed Racine's tragedy of the same name, even as the latter followed the drama of Euripides. The army of the Greeks has embarked for Troy in order to avenge the insult to their country by the capture of Helen. In the harbor of Aulis the warriors are detained by a tedious calm because their leader, Agamemnon, has killed a stag sacred to Diana and called down upon himself the vengeance of the goddess. Kalchas, the high priest, inquires of the oracle what may be done to propitiate Diana and receives the terrifying answer that naught but a human sacrifice,

even the daughter of the king, Iphigenia, can in any wise appease her wrath. At these words, paternal affection, pride, love of country and military glory wage a fearful battle in the heart of the king, who becomes still more desperate when his wife, Clytemnestra, appears at the camp with her daughter who is to be forthwith united in marriage to the hero Achilles. The murmurs of the warriors clamoring for the sacrifice and the repeated warning of Kalchas reveal the frightful truth to the unsuspecting one; but Iphigenia declares herself ready to obey the gods. She kneels at the altar and is about to receive her death-blow, when Achilles with his Thessalonian warriors hastens, by force of arms, to save his bride from sacrificial death. Kalchas, however, steps between the combatants and tells them that their zeal has already appeased the anger of the goddess; the altar is destroyed by lightning, a favorable wind arises and amidst gay dancing and songs of great rejoicing the reunion of the lovers is celebrated.

(Only in the conclusion does du Rollet differ from Racine and the latter from Euripides, on whose account Diana herself saves Iphigenia by taking her to Tauris enveloped in a cloud. Racine brings about the dénouement through Eriphile, who loves Achilles, and recognizing the hopelessness of her love, offers herself a willing victim.)

This material offered the musician the richest opportunity to describe various conditions of the soul, as well as to satisfy the desire for pomp and show inherent to grand opera. The rejoicing at the appearance of the queen and the bridal couple, and also after the rescue of Iphigenia; the encounter of the Greek and Thessalonian warriors; the solemnity of the sacrificial rites are all illustrated in most glowing colors by the music. The dances are distinguished by greater brilliancy than those of Gluck's former operas, aided by a richer instrumentation—besides the string quartette two each of the flute, oboe, horn and flageolet. A passecaille in the third scene of the second act is so charming in effect that even Gluck's most bitter enemy, Professor Forkel, was obliged to give it his approval. But the master appears most admirable where the libretto allows him to

display his skill as a dramatic author, chiefly in the ensemble pieces in which essentially different characters are united, as in the mighty ruler Agamemnon, the loving Clytemnestra wildly incensed by the loss of her daughter, the suffering Iphigenia ready for any sacrifice, and the youthful hero Achilles impelled by impetuous strength. Later composers surpassing Gluck as regards skill in counterpoint may have excelled him in *fineness* of distinction, but for truth, sincerity and strength of conviction there is nothing greater to be found in the entire realm of operatic literature than the love-duet of Iphigenia and Achilles in the first act, "Ne doutez jamais de ma flamme!" than Clytemnestra's outburst of despair in the words "Etouffez des soupirs trop indignes de vous"; than the scene of Agamemnon in the second act, "O, dieux, que vais-je faire? C'est ta fille," in which the remorse of the unhappy father is vividly portrayed; than the trio, in the same act, of Iphigenia, the mother and Achilles, in which the mild, forgiving spirit of the maiden contrasts effectively with the passionate ebullition of her partners. In relation to this trio we must agree with Marx's assertion that "Gluck had no need of the perfected art of later time, nay, its possession might have confused him and led him far astray. The characters of Gluck's conception needed nothing other than what was already at hand. As well clothe Raphael's chaste madonnas with the splendid garments of Veronese as to adorn Gluck's character with later ornamental art." ("Gluck und die Oper," II. 93.)

When Gluck brought out "Armide" he was sixty-three years old. He was exceedingly daring in this venture, for he had closely followed the libretto of Quinault and therefore ran the risk of being compared to Lully by many who still adhered to him in Paris, and also of seeing the "Armide" of the older master preferred to his. In the flush of his egotism, however, he believed he had no reason to fear this comparison; besides, it was a fascinating thing to lose himself for once in the romance of the Middle Ages, for up to this time he had set to music only subjects from ancient mythology of gods and heroes. At first Gluck seems to have intended to make no unusual exertion; the overture to "Armide" is none other than the one written

for "Telemachus" and subsequently used in the festival play "Le feste d'Apollo;" the aria of Hatred, "Plus on connaît l'amour," is an imitation of the Jupiter aria in "Philemon and Baucis," and the main features in the conspiracy-scene in the second act (Hidraot and Armide) are likewise taken from "Telemachus." In the course of the work, however, the novelty of the material and the opportunity for musical description allows greater and finally the greatest display of power, and this opera becomes well worthy to rank among his strongest works.



STATUE OF GLUCK IN PARIS OPERA HOUSE.

Executed by the sculptor Houdon. Reproduced from a photograph made for this work by special permission. One of the four life-size statues placed in the vestibule of the Opera House, at the foot of the grand marble staircase.

Quinault used as material for this libretto an episode from Tasso's "Jerusalem Redeemed." Armide, the Queen of Damascus, is an enchantress, and with the help of her genius Hidraot, has beguiled into her net a number of the crusaders who had started with Gottfried von Bouillon for the Holy Land. The captured knights are to be delivered over to the king of Egypt—when Renaud appears and releases them from the hands of the guards. "Un seul guerrier!" cry

Armide and her train filled with astonishment and rage, these words followed by a chorus of irresistible power, "Poursuivons jusqu'au trépas l'ennemi." In the second act Armide and Hidraot proceed to summon the demons in the awful words mysteriously rendered by the orchestra, "Esprits de haine et de rage, demons obéissez-nous!" Here the scene changes to a charming landscape, Renaud appears, and in sharp contrast to the preceding movement a lovely idyl led by the flute is rendered by the orchestra. Ensnared by the charm of the region, the knight sinks into slumber, but Armide approaches to take her revenge. In her magnificent monologue "Enfin il est en ma puissance," she believes herself near the goal, but the beauty of the sleeping hero transforms her hate to love and she becomes inspired with the single wish that she may chain him to her. In the third act she seeks to overcome the passion and again evokes the demons of hate, this time entreating them to free her from her love. "Venez, venez, haine implacable!" Hatred appears also, with his followers (avec sa suite) but is powerless to heal the love-wounds inflicted upon Armide. Her attempt to awaken responsive love in Renaud's breast, after having chosen an enchanted island in the ocean for a dwelling-place for both, forms the subject-matter in the fourth act, the music of which, though dramatically insignificant, is nevertheless fully calculated to disprove the assertion made by Gluck's opponents, that he lacked a sense of the grace and beauty of true melody. In the last act we see Renaud in Armide's arms entranced by her witchery. The dances executed at her command, among them the Chaconne (which at that time was indispensable to the French opera), have bewildered him, robbed him of his senses and his knightly power, when two messengers—Ubalde and the Danish Knight—appear, having been sent by the army of crusaders to his rescue. At the imperious word "Notre général vous rappelle!" he summons all his strength and frees himself from Armide's arms, but she, torn with remorse and anger causes the abode of their brief happiness to disappear in flames.

In his "Armide" Gluck made great concessions to gratify the love of the spectacular and the craving for the sensual of the opera-loving

public; in the main, however, this opera owes its chief success to the earnestness with which the master performed his task as a dramatist. As an instance of the way in which he obtained the best dramatic effects in "Armide," at the time of the representations in Paris, Gluck begged the famous singer, Larrivée, to undertake the part of the Danish Knight, though he acknowledged it a slight part for his talent. "But," he added, "it contains one passage which will be sufficient compensation." He did not say too much, for the words "Notre général vous rappelle," rendered with tremendous effect by Larrivée, called forth a storm of applause at every representation.

After this "Ride into the Land of Romance" Gluck returned again to the antique and created his last opera, "Iphigénie in Tauris," which takes first rank among his masterpieces. If in "Armide" he had dealt rather too much with externalities, in "Iphigénie in Tauris" he kept even more strictly than before within the prescribed limits of the drama, scorning that embellishment which had been added to the opera in order to distinguish it from the drama. His co-worker, in this case, was the young poet Guillard, who had framed the text of this his initial work after the tragedy of Guimond de la Touche, adding nothing, but on the contrary, discarding, with dramatic *savoir faire*, all which was not suitable to set to music. The opera does not begin with an overture, but with a short orchestral prelude which describes at first the peaceful, then the stormy sea. When the curtain rises we see the ship sail by, which bears Orestes and Pylades. After the storm—which is a masterly piece of orchestration—has subsided, Iphigenia tells her dream to her companions. In her father's palace she has seen her mother murdered by the hand of her brother Orestes, while by a supernatural power she seems compelled to murder him. Sorely oppressed by the remembrance of this dream she beseeches Diana with the touching words "O, toi, qui prolongeas mes jours" that she who once saved her life may now take back her gift. In the meantime the Scythian inhabitants of Tauris have imprisoned the Greeks cast upon the shore, and Thoas, the ruler of the land, condemns them to be offered upon the altar of Diana, and Iphigenia the priestess of the gods, to perform the sacrifice.



GLUCK'S MONUMENT IN WEIDENWANG.

In the second act we see the two friends as prisoners in the temple. To Orestes' outbursts of despair Pylades replies in the touching aria "Unis dès la plus tendre enfance." In vain! He is powerless to banish the frightful memories of Orestes, who is plunged again into despair at the separation from his friend. His words, "Le calme rentre dans mon cœur," are only a self-delusion, his real state of mind being betrayed by the feverish movement in sixteenths of the bass-viol. Not even in sleep can he find peace, for scarcely has he closed his eyes when the Eumenides appear and terrify the murderer with their cries of revenge,—and here, for the first time, the trombones are introduced. After their frightful song "Vengeons et la nature et les dieux en courroux" and the succeeding words "Il a tué sa mère,"

given pianissimo by the entire chorus and the orchestra, Iphigenia appears, questions the stranger and learns from him the terrible fate of her parent, and that Orestes himself is no longer among the living. The second act closes with a funeral celebration in honor of her brother's memory, during which the priestess mourns her loss in the aria, "O, malheureuse Iphigénie!"

One of the most beautiful and ennobling scenes of the opera is that of the third act, in which the friends contend as to which shall be sacrificed for the other, for to only one of the prisoners does the cruel Thoas, moved by Iphigenia's prayers, grant life and the permission to return to Greece. As Orestes threatens to take his own life in case he is not made the victim, Pylades yields, only with the intention of effecting his friend's release, however, immediately upon his own deliverance. This aria in praise of friendship, "Divinité des grandes âmes, amitié," is characterized at first by sweet simplicity, but at the words "Je vais sauver Oreste," the music becomes so grand—especially at the sudden introduction of the kettle-drums and trumpets, which have not been used in the entire act—as to produce an irresistible effect upon the audience.

In the fourth act Iphigenia entreats Diana, in the words "Je t'implore et je tremble, Déesse implacable," to spare her the frightful task of sacrificing the young stranger, but her supplications are unheeded. As she seizes the sacrificial knife with which she is to stab Orestes to the heart, the latter half-involuntarily exclaims: "Ainsi tu péris en Aulide, Iphigénie, o, ma sœur!" The ensuing scene of recognition in which all the composer's depth of feeling, all the passion of his heart are embodied, is of most intense theatrical effect. Now follow, one after another, the most thrilling scenes. The brother and sister resolve to escape, but are surprised by Thoas, who insists upon the sacrifice—when Pylades appears with his faithful Greeks, slays the barbarian, and amid songs of rejoicing the curtain falls for the last time.

We have already stated that "Iphigénie in Tauris" was the only one of Gluck's operas which was fully appreciated by the public at its first

representation. How is this remarkable fact to be explained? First of all we should say, without hesitation, by the impressive force of the material which is qualified to move and thrill the hearts of men in all ages, and to which has been given a form exactly suited to the operatic stage. Secondly, by the music, in which Gluck has adhered more strictly than in his previous works to his principle of according the first place to the libretto, for its very subordination to the text heightens rather than lessens the effect. Concerning the general character of this music, it is noticeable that the lyric element, which in the course of his reform Gluck sacrificed more and more to the dramatic, appears again in the sad "Iphigénie." In the choruses as well as in the arias, some of which, as we have seen, date from his Italian period, the lyric element is undeniable, while in the recitatives Gluck the dramatist is revealed in all his power. This beautiful symmetry of the forces governing the drama, the well-balanced alternation of the passive mood and the excitement called forth by the action, together give that solemnity to the music of "Iphigénie in Tauris" which fills the soul of the listener, even to the present time, and have given it the precedence of Gluck's creations.

Applause, honors and material reward for his work fell to Gluck's lot in richer measure than to any musician of his time. On the other hand he endured all those affronts seldom spared the pioneer artist who is true to his convictions. It must have grieved him especially to encounter only ill-will and crude misconception from the majority of his countrymen. Nearly all North Germany refused to recognize his works, following the example of Berlin, which, thanks to Frederick the Great, had now achieved a leading position in artistic and scientific matters. Frederick the Great himself saw in the Dresden kapellmeister, Hasse, the foremost representative of the opera, and asserted that Gluck knew nothing of singing and understood nothing of great operatic style. His sister, Princess Amelia, who had made a thorough study of composition under Kirnberger, upon becoming familiar with the "Iphigénie in Aulis" sent the following verdict to her teacher: "Herr Gluck, according to my opinion, will never rank as a skilled composer. In the first place, he has no inventive faculty,

secondly his melody is miserable, and thirdly there is no accent, no expression, everything has a tiresome sameness. Finally and in general the whole opera is very poor, but it is the latest craze and has numerous supporters."



Portrait of Gluck, made during his stay in Paris by Aug. de St. Aubin. From a delicate engraving on copper.

stupid simplicity of common people compared with the noble simplicity in the conduct and conversation of those of culture and refinement. In the one case all is awkward, faulty and defective, in the other graceful, true and perfect. In short, Gluck's kind of noble simplicity resembles the style of our bar-room artists, which has

Professor Forkel, one of the first musical authorities of North Germany, pronounced an even harsher and more unjust judgment on the master. As late as 1778, when the latter was about to attain the highest point of his activity with the "Iphigénie in Tauris," Forkel published in his "Critical Musical Library" a criticism of 157 pages on the works of Gluck, in which he exerted all his energy and made use of all his musical knowledge in order to prove their worthlessness. The professor took special exception to the passage in the preface to "Alceste" in which Gluck says he was trying to attain to a noble simplicity. "What the Chevalier is pleased to call 'noble simplicity,'" says Forkel, "is, in our opinion, nothing more than a miserable, empty, or, to speak more clearly, an ignoble stupidity arising from a lack of skill and knowledge; it is like the

simplicity enough, it is true, but, at the same time, much that is repulsive."

Similar expressions of professional prejudice—not to say stupidity—might be cited by the dozen; but the reader may prefer, in conclusion, to hear the voices of the noblest, most enlightened of his countrymen, which amply indemnify the master for the injustice done him by the "Leckmessern" of his time. *Goethe* expressed his reverence for Gluck in the beautiful verses which accompanied the copy of "*Iphigénie in Tauris*" which he sent the singer Milder:

"Dies unschuldvolle, fromme Spiel
Das edlen Beifall sich errungen,
Erreichte doch ein höheres Ziel
Von *Gluck* betont, von *dir* gesungen."

(This noble drama, from corruption free
Won the unfeigned applause of thoughtful men,
But reached a still more lofty purpose, when
To music set by Gluck, and sung by thee!)

Just as sincerely did Wieland, the great master of poetry, pay homage to music and its great exponent. "I have moments," he wrote on July 13th, 1776, "in which I long inexpressibly for the ability to produce a lyric work worthy to receive life and immortality through Gluck. And oh! that we might once be fortunate enough to see and hear him in our midst! That I might see the man face to face and in his presence give some slight expression to the emotions kindled by the little I have heard (and very poorly rendered) of his splendid works!" The year before, Wieland had spoken still more specifically in regard to the Gluck reform; in 1775, he wrote in the "German Mercury": "At last we have lived to see the epoch in which the mighty genius of a Gluck has undertaken the great work of a musical reform. The success of his '*Orpheus*' and '*Iphigénie*' would lead us to hope everything, if, in those capitals of Europe where the Fine Arts have their chief centre, innumerable obstacles did not

oppose his undertaking. To restore their original dignity to those arts which the populace have been accustomed to regard as the tools of sensual enjoyment, and to seat Nature firmly on a throne which has been long usurped by the arbitrary power of fashion, luxury and voluptuousness, is a great and daring venture. Gluck has shown us what might be done by music, if in our day there were an Athens anywhere in Europe, and if, in this Athens should appear a Pericles who should do for the opera what he did for the tragedies of Sophocles and Euripides."

Words of this kind were not spoken in vain; their power, together with Gluck's music, could not but succeed in breaking down the opposition of even the strictest adherents to the old régime, and before the beginning of another century all the master's enemies had left the field. From that time to the present day, there has been no serious-minded lover of music who has not cheerfully agreed with the motto to be found upon the bust of Gluck in the Grand Opera in Paris:

"Il préféra les Muses aux Sirènes."
(He preferred the Muses to the Sirens.)

W. Langhans.



FRESCO IN VIENNA OPERA HOUSE REPRESENTING GLUCK'S "ARMIDE."
From a photograph.

FOOTNOTES:

[1] It was not until the last decade of his life that there was formed in the circles of the well-to-do merchant class a musical union which survives to-day as the "Institution of the Gewandhaus Concerts." Bach was probably not a member of the society, at any rate, not an influential one.

[2] Among these works the two in F major and A major are the most beautiful.

[3] To the latter Charles Jennings had appended verses forming a third part: "*Il moderato*."

[4] According to Fürstenau ("History of Music and the Theatre at the Court of Dresden," II., 249), it is not improbable that Gluck conducted the opera at Hamburg from Nov. 15-27, 1747.

[5] At the twentieth double representation Gluck's work brought 3115 livres, that of Piccini, but 1483 livres. It goes without saying that the number of people in the audience can never be a criterion for the intrinsic value of a work of art, unless the author

has made no concession to the taste of the masses. But as Gluck, since his "Orpheus," had absolutely refused to do this, the applause of the general public has all the more weight.

Transcriber notes:

- P. 3. 'Van Quickleberg' changed to 'Van Quickelberg'.
P. 21. 'rythmically' changed to 'rhythmically'.
P. 28. 'of the the work', taken out one 'the'.
P. 35. 'having disapeared', changed 'disapeared' to disappeared'.
P. 39. 'He died Oct. 24, 1825', the year is '1725', changed.
P. 47. 'is probab y' changed to 'is probably'.
P. 154. 'Neapolitan musican', changed 'musican' to 'musician'.
P. 158. 'best musican', changed 'musican' to 'musician'.
P. 159. 'Sonzogno competition', changed 'competition' to 'competition'.
P. 164. 'ecclesiastial music', changed to 'ecclesiastical music'.
P. 184. 'extented organ', changed 'extented' to 'extended'.
P. 220. 'musicial activity', changed 'musicial' to 'musical'.
P. 223. Illustration, 'CHRISTOPH WILIBALD GLUCK' should be 'CHRISTOPH WILLIBALD GLUCK', changed.
P. 234. 'is dangerrously ill', changed 'dangerrously' to 'dangerously'.
Corrected various punctuation.

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